more satisfactory manner than is usually the case in text-books on mechanics. The book is certain to prove a useful one to all those who are engaged in teaching the subject of mechanics to engineering students, and the number of well-selected examples makes it a particularly satisfactory book for the student himself. Many young engineers are far away from help in matters of this nature, and have to depend upon their own resources—it is essential in such a case that they should have a large number of practical problems to work through in order to familiarise themselves with the principles underlying each branch of the subject.

(2) This book has been written specially for artillery officers detailed for duty in ordnance factories; it is copiously illustrated, and special attention has been given to the relative advantages and disadvantages of different types of machine tools, and to different methods of transmitting motion to the tools.

The first section is devoted to such details as the transmission of motion from one shaft to another by belting and gearing, quick return motions, cams, sliding pairs, turning pairs, and screw pairs, and in each case brief notes are given as to the important points to which attention should be paid in order to secure good results and to maintain all working parts in good order.

The second section deals with all the more important machine tools which are to be found in a modern workshop; in each case a regular order of treatment is followed—first the parts exterior to the machine itself and transmitting motion to it are discussed, and then in order the links in the machine receiving this motion, the links of the machine transmitting movement to the work, the links of the machine transmitting movement to the cutting tool, and lastly any other specialised link, and the frame. This is a method of treatment suitable not only for the non-technical student, but also for students who are just beginning the study of machines and machine tools, and the illustrations, which form a special feature of the book, are so arranged that the reader has no difficulty in finding at once in any of the figures the link of the machine which is described in any particular paragraph of the written description of the machine.

The third section deals with the cutting tools used in the various types of machine tools, methods of tempering, angles for the cutting edge for different classes of work, methods of lubrication, and speed of cutting are all discussed in detail, and a few paragraphs are devoted to the employment of the new high-speed steels.

In view of the fact that interchangeability of parts is now so important in all cases where large numbers of similar machines are constructed, the fourth section is entirely given up to an account of the construction and use of various types of gauges, with a series of useful notes on the precautions which must be adopted to ensure that their employment shall secure the desired result. The book should be consulted by all those who are engaged in the design of machine tools.

T. H. B.

## A BELGIAN BOTANIST.

*Notice sur Léo Errera.* By L. Fredericq and J. Massart. Pp. 153. (Bruxelles: H. Lamertin; London: Williams and Norgate, 1908.)

*Recueil d'Œuvres de Léo Errera.* Vols. i. and ii. Botanique générale. Pp. iv+318 and v+341. Vol. iii. Mélanges Vers et Prose. Pp. xiv+222. (Bruxelles: H. Lamertin; London: Williams and Norgate, 1908–9.)

IT would be difficult to overestimate the influence of the two great German professors, Anton De Bary and Julius Sachs, on the progress of botany. At a time when many fundamental ideas were only beginning to take shape, these advanced workers and leaders of thought attracted a succession of brilliant students from many European countries, who absorbed in Strassburg and Würzburg the doctrines and inspirations of their masters, and eventually spread abroad the new theories and conceptions that are now regarded as the foundations of botanical science. Amongst this band of eager students was the Belgian, Léo Errera, who entered first De Bary's laboratory in 1897, and subsequently sought further experience under the tutelage of Sachs. Two important results can be traced to these courses of foreign study. In the first place, intercourse with such gifted teachers and with brilliant colleagues helped to stimulate the energies of an already keen enthusiast, and to pave the way for future friendships and associations. In the second place, his interests were diverted from systematic to chemico-physiological botany, which became one of the chief lines of research at the University of Brussels.

The first of his primary contributions to science was the paper on glycogen in the Mucorineæ; this was the outcome of research in De Bary and Hoppe-Seyler's laboratories, and required a profound knowledge of the two sciences of botany and chemistry. It was followed by other papers on the same and other physiological subjects published by himself or his students. Prof. Errera was also well versed in mathematics and physics, evidence of which is furnished by the course of molecular physiology prepared for his advanced students. The researches connected with glycogen and the localisation of alkaloids, the papers on the application of physical chemistry to the elementary phenomena of cells, the relations of flowers and insects, and the defensive structures of plants, may be regarded as his chief contributions to botany.

As a professor, Errera took the keenest interest in his students, and spared no pains to stimulate their energies towards the acquirement of knowledge and the prosecution of research. At the time when practical courses were not yet customary he initiated a course which was first held in two small rooms in the gardens, and later in a more spacious laboratory provided at his own expense in a neighbouring building. The biography compiled by two of his former students bears testimony to the enthusiasm he inspired, and provides a realistic picture of his varied talents. He was an accomplished linguist, an excellent lecturer, and an entertaining companion.

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The papers on general botany collected in the two volumes noted above are of a popular nature, as his more technical contributions have been published in the *Recueil de l'Institut botanique de l'Université de Bruxelles.* The first is a letter describing the vegetation in the neighbourhood of Nice, written when he was sixteen years old. The article on the structure and methods of fertilisation of flowers appeared four years later; it was inspired by Charles Darwin's work, and the introductory quotation from the "Origin of Species," taken in conjunction with his essay on Darwinism, is worth reproducing:—"Whoever is led to believe that species are mutable will do good service by conscientiously expressing his convictions." The article is, to a large extent, an account of contemporary investigation, but includes original notes on the oxlip and the genus Pentstemon. The essay entitled "Une Lecon élémentaire sur le Darwinisme" was revised in 1903, after the publication of de Vries's book. Errera fully accepts the mutation theory, regarding it as an amplification, and not a contradiction, of the selection theory. The references in this paper to Dr. Scott's work on Cheirostrobus and the joint communication by Drs. Scott and Oliver on Lagenostoma will serve to indicate how the author incorporated the very latest results into his teaching.

The most interesting part of the third volume, containing miscellaneous verse and prose, will be found in the collection of extracts and aphorisms. Here is an epigram that will be appreciated by philosophers generally:—"La vérité est sur une courbe dont notre ésprit suit eternellement l'asymptote." The authors of the biography are to be congratulated on presenting such an interesting account of the brilliant alumnus of Brussels University. The papers are worthy of consultation, not alone for the facts contained, but also for style and arrangement.

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## OUR BOOK SHELF.

*An Atlas of Skiagrams, illustrating the Development of the Teeth, with Explanatory Text.* By Dr. J. Symington, F.R.S., and Dr. J. C. Rankin. Pp. 47; pl. xii. (London: Longmans, Green and Co., 1908.) Price 10*s.* 6*d.* net.

THE difficulty of cutting sections comprising both soft and highly calcified parts without causing displacements, and the further trouble of piecing together the disposition of parts in a large number of serial sections so as to reconstruct a model in the solid, gives to skiagrams an especial value, as being a representation of the relations of the developing teeth to one another and to the jaws which is beyond suspicion of disturbance. Certain difficulties arising from the teeth being disposed in an arch were very successfully met by the authors, who resorted to tipping the back of the skull upwards to a uniform extent in all cases, namely, raising the back about 30 degrees, and by this method the shadows of the front teeth were separately projected and the overlapping of the shadows to a great extent avoided. The skulls used were divided into halves, and the right and left sides both presented in nearly every case where the skulls used were more than seven years of age; but in the younger ones, no difference being found between the two sides, only one is presented.

The ages of the subjects used range from birth to adult life, and twenty-three skiagrams are given which illustrate the calcification of the temporary teeth and their change to the successional set; amongst other points clearly shown, the extent of calcification in each tooth, at each age, a point sometimes of medicolegal importance, is well seen. Some points in the relation of the growth of the jaws to the development of the teeth can be advantageously studied in these skiagrams, as well as the relation of the developing teeth to the antrum. Inasmuch, however, as the walls of the antrum cannot always be very clearly traced in the midst of shadows cast by other parts of the upper jaws, the anatomy of the antrum is also illustrated by drawings made subsequently from the same specimens, the technique adopted being to harden the tissues in formol, and then to chip away as much of the bone as could be removed without destroying all support. The lining membrane so treated becomes sufficiently firm to stand alone and retain its shape, and the dissections made were carefully drawn. These figures include also the accessory sinuses. The authors may be congratulated upon having produced an atlas which is of the greatest service in adding to the accuracy of our knowledge of the development of the teeth and of their relations to the parts about them.

*Mineralogie und Geologie für schweizerische Mittelschulen.* By Dr. Hans Frey. Dritte Auflage. Pp. iv+234. (Vienna: F. Tempsky; Leipzig: G. Freytag, 1909.) Price 2.75 marks.

THIS work, which has evidently been successful, is of the type commonly used in German-speaking schools, and makes no special appeal to the beginner's interest in field-observation, or to the splendid object-lessons ranged around him in his native land of Switzerland. A number of Swiss illustrations are, however, inserted, and the passages on mountain-building and the Alpine lakes embody considerations raised in recent times. To a British mind the mineralogical section will seem to contain far too much in a small compass, if the course is to be gone through systematically before the pupil enters on his collegiate years. It occupies half the book, and is followed by a petrographic chapter, which similarly bears traces of having been brought somewhat hesitatingly towards modern modes of statement and classification.

The section on historical geology, perhaps in accordance with a settled syllabus, is limited to thirty-four pages, and the illustrations of fossils are given without any explanation as to the nature of the organisms. In these circumstances, the generic and specific names are worse than useless; they need, moreover, some revision and press correction. A great opportunity still remains for making the mineralogy and geology of Switzerland serve as an introduction to these sciences, and for letting the land itself speak to the pupil, before he becomes entangled in the strings of facts which are supposed to be inseparable from a scientific education. G. A. J. C.

*Gilbert White and Selborne.* By Henry C. Shelley. Illustrated from photographs by the author. Pp. xvi+226. (London: T. Werner Laurie, 1909.) Price 6*s.* net.

THIS little book is not badly done so far as it goes, but there is nothing in it that has not often been said before; the photographs are good, but of quite familiar objects. The one innovation consists in eking out a volume offered at six shillings by "Cameos from the Natural History of Selborne," which occupy fifty of these meagre pages: a serious literary blunder, to use a mild word. The six shillings might be much better spent in the purchase of an edition of the famous book, which is much talked of but probably little read.

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